

# A Clinical Study of Prognostic Factors in Typhoid Ileal Perforation: in a Tertiary Hospital

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## Abstract

**Background & Objectives:** Typhoid Ileal perforation is a common problem seen in tropical countries. Over the years advances in the treatment of typhoid fever has decreased the incidence of typhoid ileal perforation. This study is conducted to throw a light on prognostic factors in the surgical outcome of typhoid ileal perforations.

**Methodology:** Fifty consecutive patients clinically diagnosed as having typhoid ileal perforation was taken for the study over a period of 18 months from November 2012 to May 2014. Pre-operative patients were investigated for the air under the diaphragm using upright chest X-ray and erect abdomen X-rays. Blood culture and WIDAL tests were done to diagnose the patients that they were suffering from typhoid fever. Patients with general peritonitis due to other causes excluded from the study.

**Results:** Out of 50 patients there were 40 (80%) males and 10 (20%) females, thus the male:female ratio was 4:1. Their ages ranged from 16-58 years. There were 32 patients presented early and 18 patients presented lately. The patients presented to the hospital with spectrum of symptoms. All the patients had pain abdomen to present with. Out of which 29 patients had fever, 33 had dehydration, and 16 had shock on presentation. In these 50 patients 33 patients had single perforations and 17 had multiple perforations. The single perforation was treated with simple closure and resection anastomosis was done in cases of multiple perforations. The patients were observed for complications of surgery. The mean hospital stay was 13.28 days. We lost 6 cases. There were 19 cases of wound infection, 12 cases of wound dehiscence, 7 cases of enterocutaneous fistula, 4 cases of respiratory tract infections. The blood culture was positive in 4 cases, and the culture yielded *Salmonella typhi*. The WIDAL

test was positive in 44 cases. There were 13 cases of abdominal fluid culture positive. All yielded the growth of *E.coli*.

**Conclusion:** Typhoid ileal perforation is one of the most common surgical emergency encountered by the general surgeon. Widal test is still useful in the diagnosis of typhoid fever in our country. The number of perforations and the peritoneal contamination, and the delay in getting medical facility-surgery, shock at the time of presentation at hospital are directly proportional to the morbidity and mortality. Availing early medical facility which is a modifiable risk factor. If timely early medical attention is sought majority of morbidity and mortality can be tackled.

**Keywords:** Typhoid, Ileal Perforation, Prognosis.

## I. INTRODUCTION

Typhoid fever, a severe febrile illness caused primarily by a gram negative bacillus *Salmonella typhi*, has continued to be a public health problem in many developing countries<sup>[1,2]</sup>. Typhoid infection is generally transmitted by faeco-oral route and may occasionally lead to an epidemic, particularly in areas with poor sanitation and limited availability of clean, potable water<sup>[1,2,3,4]</sup>. It is a global health problem that can have a devastating impact on resource of poor countries and it is estimated that more than 33 million cases of typhoid fever occur annually causing more than 500,000 deaths<sup>[2,5,6]</sup>. While control of the infection has been achieved in developed countries by effective public health measures, developing countries continue to bear the burden of the disease, principally because many communities still fall short of standards for drinking water, hygiene and sanitation<sup>[2,7,8]</sup>.

Intestinal perforation is a serious complication of typhoid fever and remains a significant surgical problem in developing countries, where it is associated with high mortality and morbidity, due to lack of clean drinking water, poor sanitation and lack of medical facilities in remote areas and delay in hospitalization<sup>[9]</sup>. The rates of perforation have been reported in literature to vary between 0.8% and 18%<sup>[10,11,12,13]</sup>. The high

incidence of perforation in most developing countries has been attributed to late diagnosis and the emergence of multi-drug resistant and virulent strains of *Salmonella typhi*<sup>[14]</sup>. The disease affects mostly young adults who contribute enormously to the economy of third world countries<sup>[14,15,16]</sup>. It also affects children and it is most common in people in the low socio-economic strata<sup>[15]</sup>.

The management of typhoid intestinal perforation poses diagnostic and therapeutic challenges to general surgeons practicing in resource limited countries<sup>[6,15]</sup>. Surgery is considered the treatment of choice in order to improve the chances of survival of patients with this condition, who most often present late<sup>[17]</sup>. The management of these patients provides a number of unique challenges to the attending surgeon. Many of these patients present at and are managed in rural hospitals where resources are often very limited. The outcome of treatment of typhoid intestinal perforation may be poor especially in developing countries where late presentation of the disease coupled with lack of clean drinking water, poor sanitation, lack of diagnostic facilities and emergence of Multi-drug resistant (MDR) strains of *S.typhi* resulting from inappropriate and indiscriminate use of antibiotics are among the hallmarks of the disease<sup>[6,18]</sup>. Late presentation, inadequate preoperative resuscitation, delayed operation, number of perforations and the extent of fecal peritonitis have been found to have a significant effect on prognosis<sup>[19,20]</sup>.

While mortality in the developed world has dropped to between 0% and 2%<sup>[21,22]</sup>. Mortality in the developing world remains high at between 9% and 22%<sup>[14,15,23]</sup>. The reasons for this state of affairs have not been evaluated in our setting. Despite the high mortality and morbidity of typhoid intestinal perforation in developing world relatively a little is known about the pattern of this disease and its prognostic factors in our set up. The purpose of this study was to describe our experiences on the surgical management of typhoid intestinal perforation outlining the clinical profile and treatment outcome of this disease and to determine the prognostic factors for

## II. AIMS AND OBJECTIVES

The aims and objectives of this study are

To study the difference in survival rates of early and late presentation of typhoid ileal perforation at the hospital.

To study the effect of the number of perforations on the outcome of typhoid ileal perforation.

morbidity and mortality in our local setting. It is hoped that identification of these factors will help in policy decision making, prioritizing management and improving the quality of care in typhoid intestinal perforation.

Ileal perforation is a common problem seen in tropical countries. The commonest cause being typhoid fever. In western countries the causes are malignancy, trauma and mechanical aetiology, in the order of frequency<sup>[24,25,26]</sup>. Over the years a definite changing trend has been observed in ileal perforations both in terms of causes, treatment and prognosis.

Despite the availability of modern diagnostic facilities and advances in treatment regimens, this condition is still associated with a high mortality and unavoidable morbidity. In the presence of advanced anaesthesia of today and tremendous improvement in resuscitative measures, every patient diagnosed to have ileal perforation is universally recommended to be treated surgically. The purpose of operative protocol is to correct the pathology while avoiding any serious accidents and to adopt a surgical procedure which is associated with minimal complications<sup>[27]</sup>. Perforation of the small bowel is a common abdominal surgical emergency faced by the general surgeon. Perforation of the small bowel is relatively common in endemic areas of typhoid, tuberculosis and parasitic infestations. Perforated small bowel challenges the surgeon's skill and his knowledge of pre-operative, intra-operative and post-operative care of severely ill surgical patient. In patients with sudden onset of abdominal pain without high index of suspicion and timely surgical intervention results in significant mortality and morbidity.

Surgery plays an important role in the management of small bowel perforation. Evaluation and management of small intestinal perforation provide some of the most challenging experiences for a surgeon with advent of new technology. This study has been undertaken in order to contribute to the improvement in the knowledge of this disease. This study aims to study the factors affecting the outcome in typhoid ileal perforations.

**NOTE:** Early presentation is taken as the presentation of the patient within 24 hours of appearance of pain abdomen. Late presentation is taken as the presentation of the patient after more than 24 hours of appearance of pain abdomen.

## III. MATERIALS AND METHODS.

### A. Source of Data

It includes all cases who are above 12 years of age and undergoing surgery for typhoid ileal perforation under surgical units at Bowring and Lady

Curzon Hospitals attached to Bangalore Medical College and Research Institute, Bangalore.

### **B. Methods of Collection of Data**

3.2.1. Study design: Prospective Comparative Study.

3.2.2. Study period: November 2012 to May 2014.

3.2.3. Place of study: Bowring and Lady Curzon Hospitals attached to Bangalore Medical College and Research Institute, Bangalore.

3.2.4. Sample size: 50 patients

3.2.5. Inclusion criteria: All patients above 12 years undergoing surgery for typhoid ileal perforation and given written consent to participate in this study.

3.2.6. Exclusion criteria: Peritonitis of appendicular perforation, Peritonitis of duodenal ulcer perforation and Peritonitis of idiopathic intra-abdominal abscess.

## **IV. METHODOLOGY**

Fifty consecutive patients clinically diagnosed as having typhoid ileal perforation was taken for the study over a period of 18 months from November 2012 to May 2014. Pre-operative patients were investigated for the air under the diaphragm using upright chest X-ray and erect abdomen X-rays. Blood culture and WIDAL tests were done to diagnose the patients that they were suffering from typhoid fever. All patients were determined their packed cell volume, serum electrolytes, urea and creatinine levels. ECGs were also taken. Diagnosis was further supported by intra operative findings of ileal perforation with associated peritoneal soilage. Patients with general peritonitis due

## **VI. RESULTS**

Fifty patients of Typhoid Ileal Perforation admitted between November 2012 and May 2014 were included in this study. Patients have been grouped into time of presentation in the hospital i.e., early against late and number of perforations they are having i.e., single against multiple. There were both males and females. Their ages ranged from 15 years to 58 years with a mean of 32.6 years. There were 40 (80%) males and 10 (20%) females, thus the male:female ratio was 4:1. Their ages ranged from 16-58 years. All patients had history of fever. Out of 50 patients 36 persons had fever for a duration of less than 14 days, and 14 patients had fever for more than 14 days. All the patients presented to hospital with the history of pain abdomen. They were classified into early and late presenters. The patients presented to the hospital with the history of pain abdomen of less than 24 hours were considered as early presenters and the others considered late presenters. Hence 32 patients presented early and 18

to other causes of such as perforated appendicitis, perforated duodenal ulcer and idiopathic intra-abdominal abscesses were excluded from the study. Pre-operative resuscitation was done including correcting anaemia, correcting electrolyte imbalances, adequate urine output was obtained and to patients were brought out of shock. Patients were kept nil by mouth. Inj. tetanus toxoid 0.5 cc was given intramuscularly. One gram of inj. Ceftriaxone given as prophylactic antibiotic. On all patients general anaesthesia was used. Exploratory laparotomy was done with midline incision. Operative findings were noted including the amount of pus and fecal matter and peritoneal contamination. The edges of the ileal perforations were freshened and primary closure was done transversely in two layers. Resection anastomosis done in selected cases. Edge biopsy from the ulcer sent for histopathological examination. Peritoneal cavity was irrigated with copious amount of normal saline. Drains were inserted to drain the paracolic gutter and pelvic cavity, these were connected to graduated plastic bags. Wound was closed with mass closure technique and the appropriate antibiotics were put. The majority of cases were treated with i.v Ceftriaxone and Metronidazole for a period of ten days. Attention was given to wound infection, wound dehiscence, residual intra-abdominal abscess, fecal fistula and death.

## **V. STATISTICAL METHODS INVOLVED**

The data obtained tabulated and percentage calculated wherever necessary. The significance of difference in early and late presentation of typhoid ileal perforation at the hospital, effect of the number of perforations on the outcome calculated.

patients presented lately. The patients presented to the hospital with spectrum of symptoms. All the patients had pain abdomen to present with. Out of which 29 patients had fever, 33 had dehydration, and 16 had shock on presentation. They were resuscitated to correct dehydration and electrolyte imbalance. Blood was sent to WIDAL, blood culture along with other routine investigations. The abdominal taps were done in all the patients and the tapped fluid sent for culture and sensitivity. Erect X-ray of the abdomen and chest were taken to confirm hollow viscus perforation, and patients were subjected for exploratory laparotomy. All the patients were given 1gm of Inj. Ceftriaxone at the time of induction of anaesthesia. The ileal perforations were repaired by means of simple two layer closure or resection anastomosis depending on the number and sites of perforations. In these 50 patients 33 patients had single perforations and 17 had multiple perforations. The single perforation was treated with simple closure and resection anastomosis was done in cases of multiple

perforations. The patients were observed for complications of surgery. The mean hospital stay was 13.28 days. We lost 6 cases. There were 19 cases of wound infection, 12 cases of wound dehiscence, 7 cases of entero-cutaneous fistula, 4 cases of respiratory tract infections. The blood culture was positive in 4 cases, and the culture yielded Salmonella typhi. The WIDAL test was positive in 44 cases. There were 13 cases of

abdominal fluid culture positive. All yielded the growth of E.coli.

**A. Sex and Age Incidence:**

The age of patients ranged from 15 to 58 years. Perforation commonly occurred in the third and fourth decades of life with 66% of patients between the ages of 20 and 40. The distributions of age and sex in all cases distributions are shown in Table 1.

**Table 1: Age and Sex Incidence in Typhoid Ileal Perforations**

Age	Male	Female	Total	Percent
10-20	3	3	6	12
21-30	11	7	18	36
31-40	15	0	15	30
41-50	8	0	8	16
51-60	3	0	3	6
<b>Total</b>	<b>40</b>	<b>10</b>	<b>50</b>	<b>100</b>

**B. Symptoms and Signs:**

Most of the patients presented with symptoms and signs of peritonitis. The commonest symptoms were abdominal pain, fever and vomiting. The commonest signs were abdominal tenderness, guarding,

intra-abdominal free fluid, distension and dehydration. Most patients of typhoid gave a history of fever. 32 percent of patients were in shock. Symptoms and signs are shown in Table 2 and Table 3.

**Table 2: Symptoms of Patients who Presented with Typhoid Ileal Perforation**

Sign	Number	Percentage
Dehydration	33	66%
Tenderness	50	100%
Guarding	50	100%
Distension of the abdomen	50	100%
Free Fluid	50	100%
Shock	16	32%

**Table 3: Signs of Typhoid Ileal Perforation**

Symptom	Number	Percentage
Abdominal pain	50	100%
Fever	29	58%
Vomiting	13	26%
Diarrhoea	13	26%
Constipation	06	12%

**C. Investigations**

6.3.1.X-Ray:Pneumoperitoneum in chest and erect abdominal x-ray was seen in 100% of patients.

6.3.2.Haematology and Biochemistry: Haemoglobin was less than 10 g/dL in none of the patients and Albumin of less than 3.5 g/dL was seen in 28 (56%) of cases. Azotaemia as defined as a Blood Urea of more than 52 mg/dL and/or Serum Creatinine more

**Table 4: Lag Period of Typhoid Ileal Perforation**

Lag period in hours	No of cases	Percentage
<24	31	62
25-48	15	30
49-72	03	06
>73	01	02
<b>Total</b>	<b>50</b>	<b>100</b>

**D. Lag Period**

It is the time interval between the onset of abdominal pain and the presentation of the patient at the hospital. In our study lag period was between 6 hours and 76 hours as shown in Table 4.

**E. Surgical Procedures:**

Simple primary 2-layer closure was the commonest procedure done in 33 patients (66%). Resection and anastomosis were done in 17 patients (34%).Table 5.

**Table 5: Surgical Procedures done for Typhoid Ileal Perforation**

Procedure	Number of Patients	Percentage
Simple primary closure	33	66%
Resection anastomosis	17	34%
Total	50	100%

**F. Number and Site of Perforation:**

Single perforations were observed in 33(66%) patients, two perforations were found in 7(14%) patients, three perforations in 6(12%) patients, whereas four perforations were seen in 4 patients(8%). In 41(82%) patients perforations occurred within 30cm from the illeocecal junction. Table 6.

**Table 6: No of perforations in Typhoid Ileal Perforation**

No of Perforations	No of Cases	Percentage
1	33	66%
2	07	14%
3	06	12%
4	04	08%
Total	50	100%

**H. Operating Time and Hospital Stay:**

The operating time varied from 60 minutes to 100 minutes for simple primary closure, an average being 88 minutes. In case of resection anastomosis, the time span was 90 to 120 minutes, the average was 116 minutes. Resection and anastomosis took a longer time than simple closure.

**G. Complications**

Complications occurred in 22 (44%) of cases. The common complications seen were respiratory tract infections, wound infections, wound dehiscence, and fecal fistula. Out of 50 patients wound infections seen in 19(38% of total patients) patients, wound dehiscence in 12(24% of total patients) patients, and respiratory complications in 8(16% of total patients). Faecal fistulae were seen in 8 (16% of total patients) cases. The highest complication rate was seen with resection-anastomosis, out of 17 patients 13 developed complications. The least complication rates were with simple primary closure, out of 33 patients 9 developed complications. Table 7.

**Table 7: Surgical procedures and their complications**

Complication	Simple closure	Resection Anastomosis	Total
Respiratory tract infections	04	04	08
Wound infections	07	12	19
Wound dehiscence	02	10	12
Fecal Fistula	01	07	08
Patients with complications	09	13	22

The length of hospital stay ranged from 6 days to 22 days, the average hospital stay being 13.28 days. The patients who underwent simple primary closure had an average stay of 12.7 days. Their counterparts who had the procedure of resection anastomosis had an average stay of 14.4 days. Table 8, Table 9 and Table 10.

**Table 8: Duration of Surgical Procedures**

Procedure	60 to 80 minutes	81 to 90 minutes	91 to 100 minutes	101 to 110 minutes	111 to 120 minutes
Simple primary closure	20	10	03	-	-
Resection Anastomosis	-	01	-	03	13
Total	20	11	03	03	13

**Table 9: Average Time of surgery**

Days in hospital	Simple primary closure	Resection anastomosis
< 7 Days	00	01

7 to 14 Days	27	07
15 to 21 Days	06	08
>22 Days	00	01
<b>Average hospital stay</b>	12.7	14.4

**Table 10: Duration of Hospital Stay**

Procedure	Mean time of surgery
Simple primary closure	88 minutes
Resection Anastomosis	116 minutes
<b>Average time per patient</b>	102 minutes

**I. Mortality:**

Among the 50 patients 6 patients succumbed to death. The mortality rate was 12%. All the patients who died were undergone resection anastomosis. There was no mortality in the primary simple closure segment. Septicaemia, faecal fistula and acute respiratory distress syndrome were the causes of death. Table 11.

**Table 11: Causes of Death in Typhoid Ileal Perforations**

Cause of death	Number	Percentage
Septicemia	04	66.67%
Fecal Fistula	01	16.67%
Acute respiratory distress syndrome	01	16.67%
<b>Total</b>	06	100%

**J. Prognostic Factors**

A variety of factors influence in the outcome of typhoid ileal perforation. This study aimed at the influence of the number of perforations and the time duration of presentation of the patient at the hospital after the onset of pain abdomen, on the outcome. In this study out of 50 patients 31 presented to the hospital within 24 hours of onset of pain. Among these 31 patients, 25 had single perforations and were treated with simple primary closure, 6 patients had multiple perforations for that they underwent resection-anastomosis. Only 8 patients developed complications. There were no deaths in this arm. 19 patients presented to the hospital 24 hours after the onset of pain abdomen. In this arm 8 patients had single perforation and received simple primary closure, 11 had multiple

perforation and subjected to resection-anastomosis. There were 12 complications in this category. All the death occurred in this group.

6.10.1. Lag Period: The time interval between the onset of pain and the presentation of the patient at the hospital has great impact on the outcome. The complications and death were more in those patients who presented to the hospital after 24 hours. Table 12.

**Table 12: Complications and Death in Respect to Lag Period**

Lag period Duration in hours	Simple Primary Closure			Resection Anastomosis		
	Total patients	complications	Death	Total Patients	Complications	Death
< 24	25	08	00	06	03	00
25 to 48	08	01	00	07	06	02
49 to 72	00	00	00	03	03	03
>73	00	00	00	01	01	01

**Table 13: Relation of Lag Period to Mortality and Complications**

Lag period in hours	No of Patients	No of Deaths	Percentage
< 24	25	00	0%
25 to 48	08	00	0%
49 to 72	00	00	0%
>73	00	00	0%

< 24	31	00	00%	49 to 72	03	03	100%
25 to 48	15	02	13.33%	>73	01	01	100%

6.10.2. Number of Perforations:

The number of perforations a definitive impact on the morbidity and mortality. As the

number of perforations increase the rate of complications and the rate of mortality increase. Table 14.

**Table 14: Relation of Number of Perforations to Complications and Death**

No of Perforations	No of Patients	No of Complications	Percentage of Complications	No of Deaths	Percentage of Deaths
1	33	09	27.27%	00	00%
2	07	06	85.71%	03	42.86%
3	06	04	66.67%	01	16.67%
4	04	03	75%	02	50%

**VII.DISCUSSION**

Typhoid fever remains a public health problem in the developing world with gut perforation being the major complication. This complication is almost invariably fatal but with the development of specific antibiotics and safe anaesthesia techniques, surgery is increasingly used to manage perforations and offers the best hope of survival<sup>[46]</sup>. Primarily, the mortality and the morbidity rate do not depend on the surgical technique, but rather on the general status of the patient, the virulence of the germs and the duration of disease evolution before surgical treatment. That is why it is so important to provide adequate pre-operative management associating aggressive resuscitation with antibiotic therapy<sup>[47,48,49]</sup>. This study has been undertaken in order to contribute to the improvement in the knowledge of prognostic factors of this disease. Typhoid ileal perforation is still seen frequently in our environment, with a preponderance among males seen in our study with male to female ratio of 4:1, similar to other's studies<sup>[47,50,52]</sup>. Most of the patients in our study belonged to 21-40 years which is also same as other studies<sup>[47,51]</sup>, while Aziz<sup>[52]</sup> and Ajao<sup>[50]</sup> reported second and third decades of life in their studies. Typhoid perforations as reported by Eggleston occurred in the second and third decades of life<sup>[33]</sup>. In this study 36% of

typhoid ileal perforations were in third decade and 30% were in fourth decade. Symptoms and signs were not different from those in other studies<sup>[47,50,52]</sup>. All the patients suffered from fever with a varying duration from 7 to 18 days. The mean duration of fever being 12.56 days. All the patients presented to the hospital with history of pain abdomen and abdominal distension. Other major complaints involved are fever, vomiting diarrhoea and constipation. Most patients presented with features suggestive of peritonitis. Patients of both typhoid and non-specific perforations had similar presentation with respect to abdominal symptoms and signs. Patients with typhoid perforation had fever, abdominal pain and vomiting. Examination revealed tenderness, guarding, distension and intraperitoneal free fluid. 8 patients were in shock on admission. Eggleston reported that most patients had fever, malaise and sudden increase in abdominal pain in typhoid perforation. Examination revealed signs of toxemia and acute abdomen<sup>[33]</sup>. All patients belonged to low socioeconomic class and the areas, where water supply and sewerage systems are not proper. Although many factors affect the prognosis of typhoid perforation but the most important are the number of perforations and the time interval between perforation and surgery.

The need for adequate resuscitation resulted in further delay before operation in some of our patients who had presented in a poor state, which was also found to affect the outcome adversely. WIDAL test is very useful investigation in diagnosing typhoid fever. It is easily available and is less susceptible to prior

therapy when compared to blood culture. This usefulness was confirmed by Jarrett<sup>[42]</sup>. In this study most patients of confirmed typhoid were treated with piperacilin or ceftriaxone and metronidazole. In the management of typhoid perforation some authors advocated conservative management<sup>[40,41]</sup>. Presently there is no such controversy in the treatment of typhoid

perforation with the current recommendation being surgical management<sup>[32]</sup>. The various methods in use are local drains, simple closure, closure with omental patch, wedge resection, resection and anastomosis, ileotransverse anastomosis and ileostomy<sup>[35,37,39,42-44]</sup>. In this study patients underwent simple closure or resection anastomosis. No patients were treated by conservative measures, wedge resection, omental patch repair ileotransverse anastomosis or ileostomy. Resection was employed in typhoid perforations wherein multiple perforations were found. No differences were found in survival between male and female patients; neither were the patients ages found to be an important prognostic factor, and same is reported by others in their studies<sup>[50,59]</sup>. The number of perforation in the gut have adverse effect on the outcome in terms of survival<sup>[50,53,54,55]</sup>. Single perforation was associated with less complications. Multiple perforations were associated with more severe complications like wound dehiscence and fecal fistula and increased mortality. Per operatively, a single perforation at anti mesenteric border of ileum within 2 feet of ileocecal valve was found in 33 (66%) patients, while rest of 17 patients (34%) had two or more than two (multiple) perforations. Thirty three patients (66%) were managed by primary simple closure and remaining 17 (34%) were treated with resection anastomosis.

Enterocutaneous fistula, which has been shown to adversely affect the post-operative outcome and mortality<sup>[47,50]</sup>. Overall rate of fecal fistula in our study was 16% of cases, which is low when compared with 10%, 8% and 8.3% in other studies, respectively<sup>[47,50,52]</sup>. In our study Septicaemia was found in 4(8%) patients. Overwhelming septicaemia was the major cause of mortality in this study. Overall mortality rate was 12% which is less comparable to other studies as 28% reported by Adesunkanmi and Ajao<sup>[50]</sup>, 16.4% by Talwar<sup>[17]</sup>, 13.8% by Aziz<sup>[52]</sup> and 48% by Ameh<sup>[46]</sup>. Most patients died in the second post-operative period and survival beyond the 14<sup>th</sup> post-operative day was associated with a high chance of complete. Widal was positive in 44% of tested cases and in 88% of patients of typhoid perforation. Widal was reported positive in 30% of patients with typhoid perforation by Kaul and in 46.1% of patients by Santillana<sup>[30,39]</sup>. It was reported positive in 75.5% of cases by Jarrett and in 73% by Vaidyanathan. The overall complication rate for all patients in this series was 64%. Typhoid perforations are associated with a high morbidity rate with literature reports between 28.5% and 81%<sup>[29,30,36,39]</sup>. Santillana in his series reported a rate of 71.9% in 96 patients. In this series typhoid perforations had a complication rate of 70%. The common complications were wound infection, wound

recovery. Survivors of typhoid perforation were faced with various post-operative complications, such as wound infection and wound dehiscence, with prolonged hospitalization and increased cost of management. The overall wound infection was observed 38%. In the literature wound infection had been observed 33-100%<sup>[19,20]</sup>. Salmonella typhi was grown in 3 patients with typhoid ileal perforation in whom blood cultures were done. All cultures were sensitive to piperacillin, Cefotaxime and ceftriaxone. Hadley reported positive cultures in 22.2% and Santillana in 48% of patients<sup>[29,30]</sup>. Prior antibiotic therapy was probably responsible for the low isolation in the study<sup>[29,31]</sup>. Another cause may be delay in plating the samples. Typhoid fever was the commonest cause of ileal perforation in tropical countries. Typhoid fever accounted for 56.6% of cases of ileal perforation in the series by Karmakar<sup>[28]</sup>. Mechanical causes and malignancy are the commonest causes of small bowel perforation in the western world. Mechanical causes and lymphomas accounted for 40.7% of perforations in the series by Dixon<sup>[56]</sup>. Malignancy was the commonest cause in the series by Orringer<sup>[57]</sup>. There were no cases of typhoid perforations in either series<sup>[56,57]</sup>. There was a male preponderance with the male: female ratio in this study being 24:1. Two cases of typhoid perforations were seen in females. Published literature shows a similar finding with reported ratios from 2.3:1 to 6.1:1. Perforation was commonly seen to occur in the second week following onset of illness<sup>[29,30,36,37]</sup>. Keenan reported that 88% of patients perforated in the second week<sup>[29]</sup>. Lizzaralde reported that 54.2% of patients perforated in the second week<sup>[37]</sup>. In this series the perforation was earlier with a majority occurring within a week of onset of fever. Chest X-ray is a useful investigation to detect hollow viscus perforation. Free gas was seen under the diaphragm in 56% of perforations and in 60% of typhoid perforation. Abdominal X-ray revealed gas of features suggestive of ileus. Pneumoperitoneum has been reported in 52% to 82% in studies by Hadley, Archampong, Tacyildiz and Vaidyanathan<sup>[29,31,39,45]</sup>.

dehiscence, faecal fistula and respiratory complication which compare with published reports<sup>[29,30,34,38]</sup>. Faecal fistula was seen in only one patient. The surgical procedure did not influence either the morbidity or the mortality in patients irrespective of etiology. Resection-anastomosis was found to have a higher complication rate but this was not statistically significant. Eggleston reported that the procedure done did not influence outcome<sup>[33]</sup>. Talwar and Sharma reported that mortality was least with early primary closure and Ameh et al found mortality was highest with wedge resection and least with resection and anastomosis<sup>[43,44]</sup>. Lag period has been known to influence both mortality and



morbidity. Regression analysis showed that the mortality and morbidity increased with increasing lag period. This association was also found in patients of typhoid perforations. Increasing lag period was associated with increased mortality in series by Archampong, Eggleston, Bose and Talwar<sup>[31,33,43,58]</sup>.

### VIII. SUMMARY AND CONCLUSIONS

This study was conducted from November 2012 to May 2014. It includes fifty cases of ileal perforation admitted to Bowring and Lady Curzon Hospitals in that period. Aetiology, presentation, management and outcome of patients with ileal perforations were studied with emphasis on typhoid fever and the factors that influenced the prognosis. Typhoid fever is the most common cause of ileal

perforation. Patients have a male preponderance and are usually in the second and third decades of their lives. Widal serology is a useful test in the diagnosis of typhoid fever. Histopathology is useful but not very useful in the diagnosis of typhoid. The type of surgical procedure did not influence outcome, either morbidity or mortality. Lag period has major impact on the patient recovery significantly influenced outcome. Shorter the lag period better the prognosis. Long lag period culminated in increased mortality and morbidity. The number of perforations directly had influence on the patient recovery. Single perforations had excellent prognosis whereas multiple perforations resulted in higher morbidity and mortality.

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